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NAVAL OCEANOGRAPHIC OFFICE NSTL STATION MS  
LITTORAL ALGAE RESERVES OF THE MURMANSK REGION (ZAPASY LITORAL'--ETC(U)  
1978 K F VINOGRADOV  
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NAVAL OCEANOGRAPHIC OFFICE TRANSLATION NOO T-16 (551)

ZAPASY LITORAL'NYKH VODOROSLEY MURMANA  
(Littoral Algae Reserves of the Murmansk Region)

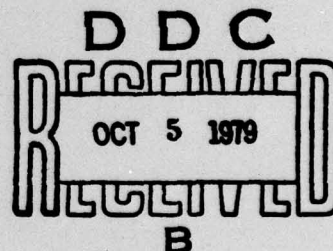
K. L. VINOGRADOV

TRUDY MURMANSKOGO MORSKOGO BIOLOGICHESKOGO INSTITUTA  
(Transactions, Murmansk Marine Biological Institute)

v. 5, n. 9

p. 37-40, 1964

1978



Translator: V. Astvazaturov  
Editor: J. Duncan  
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D. Wilson

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U. S. NAVAL OCEANOGRAPHIC OFFICE  
NSTL STATION, BAY ST. LOUIS, MS 39522

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER Translation NOO-T-16 (551)	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Littoral Algae Reserves of the Murmansk Region (ZAPASY LITORAL'NYKH VODOROSLEY MURMANA)		5. TYPE OF REPORT & PERIOD COVERED
7. AUTHOR(s) K. F. YINOGRADOV		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS Naval Oceanographic Office NSTL Station Bay St. Louis, MS 39522		8. CONTRACT OR GRANT NUMBER(s)
11. CONTROLLING OFFICE NAME AND ADDRESS Naval Oceanographic Office NSTL Station Bay St. Louis, MS 39522		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) 129		12. REPORT DATE 1978
		13. NUMBER OF PAGES 7
		15. SECURITY CLASS. (of this report) UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited. 21 Trans. of Trudy Murmanskogo Morskogo Biologicheskogo Inst. (Transactions, Murmansk Marine Biological Inst.) v5 n9 p37-40 1964, by V. Astvazaturov. (USSR)		
17. DISTRIBUTION STATEMENT (for the Abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) USSR MURMANSK MARINE BIOLOGY ALGAE		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Measurements were made in 1960 of the reserves of marine algae along the Murmansk coast from the Pechenga River to Cape Svyatoy Nos.  The mean biomass of algae varies from 0.7 to 12.5 kg/m <sup>2</sup> and total reserves are 100,000 tons raw weight. 250 450		

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## Littoral Algae Reserves of the Murmansk Region

by

K. L. Vinogradov

(Hydrobiology Laboratory.  
Director, M. M. Kamshilov)

M. S. Kireyeva and T. F. Shchapova (1933), G. P. Gur'yev (1948), T. A. Matveyeva (1948), Z. P. Tikhovskaya (1948), V. V. Juznetsov (1956), and others contributed to the quantitative evaluation of coastal macrophytes of the bays of the Murmansk region.

Papers by these authors contain data on the biomass of individual species of algae, variation of the biomass with seasons of the year, distinctive features of their habitats, the production of fucoids, and much other information. No special studies of the Murmansk region littoral macrophyte reserves had been made, however. The literature contains only fragmentary information on this subject. For example, L. A. Zenkevich (1956) points out that in the Murmansk region the littoral algae reserves may amount to 500 thousand tons of raw weight.

Because our objective was to evaluate algae reserves in the Murmansk region in order to organize their exploitation, the data found in literature appeared to be insufficient, since it did not cover all types of the Murmansk littoral zone and, in addition, it had been gathered more than 20 years ago. Since that time great changes have occurred in the marine vegetation in the main area of study (Dal'nyezelenetskaya Bay, Kola Bay, Kil'din Island), principally because of man's activity. Therefore, it seemed necessary to conduct another quantitative evaluation of algae in different types of littoral zones found in various areas along the shore.

In the middle of July of 1960, in agreement with the Polar Science Research Institute of Sea Fisheries and Oceanography, a member of the Murmansk Marine Biology Institute, V. N. Vinogradov, carried out an aerial survey of the coast. This survey determined the visual character of the littoral zone as well as the width and density of growths of littoral algae in many areas. These data served as the basis for the selection of 19 bays on the coast, which were subsequently studied in detail in August 1960 from the expedition ship, DIANA. The work was carried out by the Murmansk Marine Biological Institute of the USSR Academy of Science. A student of the Leningrad State University, L. P. Perestenko, also took part in this work.

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The test plot method is usually used in quantitative evaluations. However, on the advice of the organizer of the study, Doctor of Biological Science, M. M. Kamshilov, we used a different method in our work, i.e. determination of the biomass of algae growing on a running meter of a drying strip (of shore). A rope was stretched through the entire drying strip and along this rope all the algae were cut from a 20 cm-wide strip. At the same time, the width of each section and the quantity of seaweed in it were calculated separately. Three sections were taken in each type of littoral zone, and the average biomass per running meter and per square meter were computed for these cuts. Since our goal was to determine the total reserves of littoral algae, the present work provides average biomass data for the entire littoral zone, without subdivision into belts and individual species.

The "running meter" method produces the most accurate mean values of the biomass, because sectors of dense and sparse growths and even some sectors completely devoid of vegetation are a part of the cut.

The total reserves of algae in the littoral zone were computed by the following method: the biomass (per running meter) typical of a given type of littoral zone was multiplied by the overall length of the shoreline belonging to this type of littoral zone and the data obtained for each type were summed.

The preliminary data of the completed study were presented by M. M. Kamshilov at the 1st All-Union Conference Concerning the Algae Industry held in Archangel in October 1960. The results of the work are presented below.

The average biomass of all algae in the Murmansk region littoral zone fluctuates from 0.7 to 12.5 kg/m<sup>2</sup>, depending on the type of littoral zone and a number of ecological factors. The smallest biomasses characterize the sheer cliffs of the open coast, because the fucoids that provide the main biomass are inhibited there by the strong surf. On the sheer cliffs and deep within the well-flushed bays protected against the direct impact of the waves, the biomass increases, because of the development of fucoids, and reaches 5 kg/m<sup>2</sup>. On the sandy and rocky shoals situated within the fold of the bays, fucoids develop quite well, but the average biomass there is small, because many areas are covered by sand and consequently devoid of algae. The biomass fluctuates most heavily in rocky areas and on cliffed coasts that descend gradually or in ledges to the sea. The main factors that determine the difference in biomass in one type of littoral zone are, it seems, as follows: character of the ground, i.e. size of rocks and density of their dispersion in rocky areas, and the degree of dissection (erosion) of the cliffs, as well as the amount of surf.

As shown in the table, the total algae reserves in the littoral zone of the 19 bays of the Murmansk region comprise 28,050 tons of raw weight. This is a minimal figure, because frequently we did not include the entire littoral zone, because of the difference of the position of water level at low tide, and sometimes we were able to cover only the upper strip of the middle horizon - the Fucus Vesiculosus belt.

The total reserves of littoral algae of the entire coast, from Pechenga River to Cape Svyatoy Nos, was calculated from aerial reconnaissance and visual observation data. The smallest indices of biomass we obtained were used for the coastal sectors with an unknown type of littoral zone. The reserves of all algae in the Murmansk region littoral zone comprise at least 100 thousand tons of raw weight, including the bays studied. This of course is not millions of tons, but it is fully adequate in considering exploitation of the algae. However, efficient organization of commercial exploitation of the fucoids in the littoral zone of the Murmansk region will require not only a more exact evaluation of algae reserves, since their yield can fluctuate from year to year, but also a multifaceted study of the macrophytes. The understanding of such problems as the development cycles of algae, the regeneration of growths, and the effect of different factors of the environment on the growth rate will make it possible to organize the harvesting and synthetic planting of algae, necessary to increase the harvest without detriment to the restoration of algae reserves.



**Quantitative Evaluation Data of the Algae Reserves in the Littoral  
Zone of the Murmansk Region**

Region of Investigation	Character of the Littoral Zone	Biomass (in kg/m <sup>2</sup> )	Biomass (in kg/run.m.)	Reserves (in tons)
Pechenga Bay	Protected rocky placer Semiprotected gently sloping cliff	5.6 8.0	113.9} 98.1}	800
Bol'shaya Volokovaya Bay	Protected rocky placer Semiprotected stepped cliff	8.2 10.4	112.4} 138.6}	3750
V. Ozerko	Protected sandy and rocky shoal	2.0	300	9200
Kutovaya Bay	Protected rocky placer	6.1	345.4	2500
Ara Bay	Protected sheer cliff Protected rocky placer	5.1 12.5	15.2} 133.3}	1510
Malyy Olenyy Is.	Somewhat protected, gently sloping cliff	5.7	440.1	700
Teriberskaya Bay	Semiprotected gently sloping cliff Protected rocky placer	1.5 9.3	13.8} 205.0}	1000
Yaryshnaya Bay	Protected sandy and rocky shoal ditto Protected gently sloping cliff Semiprotected boulder placer Protected rocky placer Semiprotected rocky placer	2.8 2.6 7.4 0.7 3.5 6.3	372.5} 194.5} 84.2} 15.1} 83.0} 129.0}	2000
Dal'nezelenetskaya Bay	Exposed sheer cliff Protected rocky placer Protected sandy and rocky shoal Semiprotected gently sloping cliff	1.1 5.1 2.5 7.2	3.5} 106.4} 374.4} 89.9}	1050

Quantitative Evaluation Data of the Algae Reserves in the Littoral  
Zone of the Murmansk Region (continued)

Region of Investigation	Character of the Littoral Zone	Biomass (in kg/m <sup>2</sup> )	Biomass (in kg/run.m.)	Reserves (in tons)
Plokhiye Chervy and Bol'shye Chervy Bays	Exposed sheer cliff	1.2	4.8 }	200
	Semiprotected gently sloping cliff	6.8	89.6 }	
	Semiprotected rocky placer	4.2	191.3 }	
Bol'shoy Oleniy Is.	Somewhat protected stepped cliff	6.2	49.5	760
Tryashchina Bay	Semiprotected gently sloping cliff	7.8	39.8	200
Zolotaya Bay	Semiprotected rocky placer	7.2	137.0	80
Sem'ostrovov (Seven Islands) (Veshnyak Is.)	Semiprotected rocky placer	5.8	154.4	710
Semiostrovskiy (Seven Island) roadstead (Cape Peskanets).	Somewhat protected gently sloping cliff	7.0	98.1	2100
Sidorovka Bay	Semiprotected boulder placer	3.7	152.4	90
Drozdovka Bay	Protected sheer cliff	5.3	13.7 }	600
	Protected rocky placer	2.4	82.4 }	
Ivahovka Bay	Protected gently sloping cliff which turns into rocky placer. Somewhat protected stepped cliff.	3.7	98.7 }	700
		4.2	37.4 }	
Savikha Bay	Protected stepped cliff which turns into rocky and sandy placer.	3.8	101.4	100
Total				28050

### Conclusions

1. The work was conducted at 19 points along coast and the following types of littoral zones were studied: sheer cliffs of an exposed coast, sheer cliffs of protected areas, rocky areas, rocky littoral zone that descends gently or in steps to the sea, and sandy and rocky shoals.
2. The average biomass of all algae in the littoral zone of the Murmansk region varies from 0.7 to 12.5 kg/m<sup>2</sup>.
3. The total reserves of littoral algae of the Murmansk region, from the Pechnega River to Cape Svyatoy Nos, comprise at least 100 thousand tons of raw weight.



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